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ABSTRACT

Checklists for use in evaluating the progress of students in the primary and middle grades of elementary school in terms of their understanding of the methods of science and some aspects of scientific literacy are presented. The checklists are based on the objectives of the Science Curriculum Improvement Study, and deliberately ignore subject matter knowledge. The checklists are of two types: one, in report card format, lists behaviors which can be used as evidence that can serve as "observable indices that selected goals" are being achieved; the other lists a smaller number of key behaviors on a tally sheet designed to report progress of an entire class. A brief account of the development of the checklists is included. (AL)

AN EVALUATION SCHEME FOR ELEMENTARY SCIENCE

(Science Curriculum Improvement Study)

By V. Eugene Vivian,
Glassboro State College

OVERVIEW

The evaluation of goals of instruction in the Science Curriculum Improvement Study (SCIS) for elementary science has not been formalized at the present writing.

This report is an attempt to induce teachers to focus their attention on some of the cognitive and affective behaviors which are intended or implied outcomes in the SCIS program. In addition, some learning skills as evidenced by individual or group behaviors are items deemed worthy of concern.

This evaluation scheme was formulated with the assumption that science facts and generalizations have been satisfactorily acquired by the learners if SCIS materials were presented in a manner suggested by the teacher manuals and if the laboratory and study materials were utilized. In other words, the knowledge component was deliberately ignored in the scheme to get at some aspects of what is generally termed:

a. understanding the methods of science
b. certain aspects of scientific literacy significant for primary grades

PROCEDURE

Fifty-seven teachers from four school districts in Southern New Jersey enrolled in a Cooperative College School Science training program for SCIS materials developed the scheme in an effort to assist in evaluation. Two committees one for the primary grades, and one for the middle grades, sought to list a series of student behaviors which would serve as observable indices that selected goals of instruction were being achieved. The teacher participants then categorized the list of behaviors and reproduced them in report card form. (See attached forms.) The sponsoring committees then recommended that the teachers use the forms as one means of evaluating pupil progress.

The teachers began this evaluation technique in December since many of their materials were not made available until late October.

Feedback was sought with respect to:

a. proposed modifications in the behavior items and categories
b. a subjective preliminary evaluation of the usefulness or value of the scheme

RESULTS

Modifications were suggested for several of the behavioral items, chiefly in the form of consolidating those for which distinctions seemed difficult to observe or pointless to indicate. (The modified list is attached.)

In order to facilitate evaluation for entire classes, a tally sheet was devised using key behaviors or categories. The newly devised tally sheet for reporting progress for an entire class is attached.

RECOMMENDATIONS AND CONCLUSIONS

1. Teachers reported that the scheme assisted them to focus their attention on the behavior deemed desirable.

2. Teachers recommended that they utilize a reporting scheme to harmonize with the system of evaluating achievement or progress in other subjects. Two of these systems are shown on the tally sheet. With this modification the tally sheets were deemed feasible for use.

3. Some teachers felt that tests for acquisition of knowledges were necessary to supplement the scheme described above.

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Cooperative College School Science Program
Glassboro State College and School Districts of Glassboro,
Hammonton, Salem and Willingboro

Tentative Checklist for Evaluation of Priority Objectives for
Elementary Science (Science Curriculum Improvement Study)
Primary Grades

A. Sensitivity
   1. Observes and describes changes in his total environment.
B. Curiosity
   1. Asks questions about aquaria and materials.
   2. Makes comparisons between his and his neighbor's work.
C. Creativity and Imagination
   1. Suggests new uses of materials and/or procedures.
   2. Suggests using new or different materials.
   3. Predicts the outcome of a problem or situation.
   4. Transfers SCIS context into other areas, i.e., stories, pictures, vocabulary.
   5. Presents ideas original to himself.
   6. Exhibits or demonstrates original ideas.
D. Cognitive Skills
   Observes
   1. Observes differences and likenesses.
   2. Observes growth and change
   3. Observes changes in form of materials.
   Questions
   1. Asks thought-provoking questions ("how come," "why," "what," etc.)
   2. Asks relevant questions.
   3. Asks "housekeeping" type questions.
   4. Asks attention-getting questions.

   Seeks Answers
   1. Seeks answers in books.
   2. Designs experiments to answer questions.
   3. Involves other children and adults in answering questions.
   Hypothesizes
   1. Makes random predictions.
   2. Makes careful predictions.
   3. Draws inferences from presented material.
   4. Forms hypotheses to answer questions.
   Draws conclusions from observations.
   General
   1. Maniuplates SCIS materials independently and constructively.
   2. Uses scientific vocabulary correctly in context in lessons other than SCIS.
E. Attitudes
   1. Conserves materials and environment.
   2. Listens to and tries ideas of others.
F. Group and Social Skills
   1. Participates as an individual.
   2. Interacts with group.

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Tentative Checklist for Evaluation of Priority Objectives for
Elementary Science (Science Curriculum Improvement Study)
Middle Grade

A. Participation
1. Shares findings verbally with peer group.
2. Exchanges ideas with partner verbally.
3. Cooperates with others.

B. Observation
1. Shows evidence of observing details.
2. Verbally points out details to others.
3. Draws before and after pictures.
4. Writes descriptions of observed objects or events.
5. Shows differences with concrete objects.
6. Voluntarily goes to observation spots for new evidence.
7. Makes comparisons and contrasts.
8. Identifies discrepant objects or events.

C. Curiosity and Involvement
1. Asks questions.
2. Asks questions based on inference.
3. Perseverence in projects undertaken.

D. Application
1. Uses what has been previously learned.
2. Identifies materials.
3. Verbally refers to past experience
4. Manipulates materials voluntarily.
5. Relates concepts to new situations.

E. Language Skills
1. Uses new science vocabulary appropriately in everyday conversation.
2. Uses new science vocabulary appropriately in identifying materials.
3. Writes record of observations.
4. Reads and interprets charts, graphs, tables.
5. Uses library research skills.
6. Makes oral or written reports.
7. Makes accurate measurements.
8. Organizes and classifies observations and data.
9. Keeps accurate written records.

F. Cognitive Skills
1. Formulates hypotheses verbally.
2. Plans procedures to solve problems or answer questions.
3. Predicts outcomes.
4. Makes predictions of expected outcomes.

G. Special SCIS Context
1. Shows and describes properties of objects.
2. Shows and describes evidence of interaction.
3. Shows and describes systems.
4. Shows and describes subsystems within a system.
5. Shows and describes objects within systems and subsystems.

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   2. Transfers SCIS context into other areas, i.e. stories, pictures, vocabulary
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   Observes
   1. Observes differences and likenesses.
   2. Observes growth and change.
   3. Observes changes in form of materials.
   4. Classfies and organizes materials
   Questions
   1. Asks though-provoking questions ("how come," "why," what," etc.)
   2. Asks relevant questions.
   3. Asks "housekeeping" type or attention-getting questions.

Primary Grades

   Seeks Answers
   1. Seeks answers in books.
   2. Designs experiments to answer questions.
   3. Involves other children and adults in answering questions.
   Hypothesizes
   1. Makes predictions not based on evidence.
   2. Makes predictions based on evidence.
   3. Draws inferences from material presented.
   4. Forms hypotheses to answer questions.
   Draws conclusions from observations.
   General
   1. Manipulates SCIS materials independently.
   2. Uses scientific vocabulary correctly in context in lessons other than SCIS.
E. Attitudes
F. Group and Social Skills
   1. Participates as an individual.
   2. Interacts with group.
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   2. Cooperates with others.

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   1. Shows evidence of observing details.
   2. Verbally points out details to others.
   3. Draws "before and after" sketches.
   4. Writes descriptions of observed objects or events.
   5. Shows differences with concrete objects.
   6. Voluntarily goes to observation spots for new evidence.
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   8. Identifies discrepant objects or events.

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   1. Asks questions.
   2. Asks questions based on inference.
   3. Perserverance in projects undertaken.

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   1. Uses what has been previously learned.
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   2. Uses new science vocabulary appropriately in identifying materials.
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   4. Reads and interprets charts, graphs, tables.
   5. Uses library research skills.
   6. Makes oral or written reports.
   7. Makes accurate measurements.
   8. Organizes and classifies observations and data.
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   1. Formulates hypotheses verbally.
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   1. Shows and describes properties of objects.
   2. Shows and describes evidence of interaction.
   3. Shows and describes systems.
   4. Shows and describes subsystems within a system.
   5. Shows and describes objects within systems and subsystems.

A Check List of Index Behaviors for Evaluation in Elementary Science (SCIS)

(Primary Grades)

Scales: S (✓) = Behavior positively exhibited
N (–) = Behavior needs strengthening
I (I) = Improvement shown

Children's Names	Observes changes or differences	Classifies and organizes	Uses new procedures or materials	Originates ideas	Thought-provoking questions	Relevant questions	Seeks answers or performs experiments	Predicts - not based on evidence	Draws Inferences	Forms Hypotheses	Listens to and tries others' ideas

A Check List of Index Behaviors for Evaluation in Elementary Science (SCIS)

(Middle Grades)

Scales: *S (✓) = Behavior positively exhibited*
N (-) = Behavior needs strengthening
I (I) = Improvement shown

Children's Names	Exchanges ideas	Observes details	Compares and contrasts	Questions based on inference	Uses previous learnings	Relates concepts to new situations	Records or reports findings	Organizes and classifies	Forms hypotheses verbally	Predicts outcomes	Utilizes key concepts (SCIS)